

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1 and 7-15 are pending in the present application. Claims 1, 7-9, 12, and 13 are amended, Claims 2-6 are canceled and Claims 14 and 15 are added, all without the introduction of any new matter.

Claim amendments find support in the claims as originally filed and thus, no new matter is added.

In the outstanding Office Action, the title is objected to as not descriptive; Claims 1, 6 and 9 are objected to as including informalities; Claims 1-13 are rejected under 35 U.S.C. § 103(a) as unpatentable over Miyagoshi (“Feasibility of Inspecting Defected in Printed Circuit Boards by Using Eddy-Current Testing”) in view of Tiernan et al. (U.S. Pat. No. 6,150,809, herein “Tiernan”).

Before turning to the outstanding prior art rejections, it is believed that a brief review of the present invention would be helpful.

In this regard, as discussed in the interview held on December 20, 2005¹, the present invention describes a spin-valve magnetoresistive (SVMR) element, which is a specific type of GMR element and has a significantly different structure from other GMR elements. Additionally, the SVMR element detects magnetic fields based on a mechanism quite different from other GMR elements. Particularly, the SVMR element has a basic three-layered structure of a pinned layer, spacer layer and a free layer as well as an anti-ferromagnetic layer (pinning layer) for fixing the magnetization of the pinned layer. As a result of the specific structure, the SVMR element has a specific selectivity of detection

¹ In view of the newly added limitation to Claim 1, the reminder of the discussion on December 20, 2005, is believed to be no longer relevant as these limitations were not specifically treated.

direction based on the magnetization direction of the pinned layer determined by the function of the pinning layer.

Turning now to the 103 rejection in the outstanding Office Action, Applicants respectfully traverse the 103(b) rejection based on Miyagoshi and Tiernan for the following reasons.

Claim 1 recites, in part,

a planar exciting coil of meander-type at least having a pair of current lines in parallel with each other through which exciting currents flow in opposite directions to each other during the testing, for generating an alternative magnetic field applied to a subject to be nondestructively tested by said exciting currents, and

at least one spin-valve magnetoresistive element comprising a multilayered film laminated in parallel with a planar plane of said exciting coil, and positioned on a central axis between said pair of current lines and on the opposite side to said subject in relation to said exciting coil, for detecting a magnetic field generated from said subject by an eddy-current induced by said alternative magnetic field,

said multilayered film including a free-magnetization-direction layer magnetized perpendicularly to said pair of current lines under a condition without any external magnetic field and a pinned-magnetization-direction layer magnetized in parallel with said pair of current lines.

According to the portion of Claim 1 noted above, a SVMR element and a meander type exciting coil are combined with each other, where a free-magnetization-direction layer of the SVMR element is magnetized perpendicularly to the pair of current lines of the meander coil under a condition of no external magnetic field being applied. A pinned-magnetization-direction layer of the SVMR element is magnetized in parallel with the pair of current lines of the meander coil. Consequently, the specific combination creates highly sensitive detection of only a slight change of the eddy-current direction.

Miyagoshi describes an excitation coil and a figure-of-8 pick-up coil. However, Miyagoshi does not describe or suggest using a SVMR element comprising a multilayered film laminated in parallel with a planar plane of an exciting coil.

The outstanding Office Action relies on Tiernan as describing the MR element required by Claim 1. Tiernan describes two spin valve GMR arrays in the section entitled INDUSTRIAL APPLICABILITY,² however, Tiernan does not describe a meander type coil with planar shape. Further, Tiernan does not describe or suggest combining a meander coil and a SVMR element.

Additionally, the combination of a meander coil and a SVMR element, as described in Claim 1, is unique and not obvious to one skilled in the art. Neither Miyagoshi nor Tiernan describe that a free-magnetization-direction layer of the SVMR element is magnetized perpendicularly to the pair of current lines of the meander coil under the condition without any external magnetic field, or that a pinned-magnetization-direction layer of the SVMR element is magnetized in parallel with the pair of current lines of the meander coil creating highly sensitive detection of only a slight change of the eddy-current direction. Further, the effect created by these features cannot be achieved by combining the GMR element of Tiernan with the device of Miyagoshi.

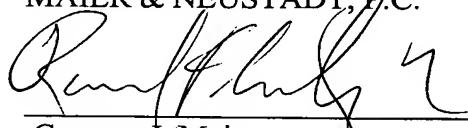
Accordingly, Applicant respectfully submits that independent Claim 1, rejected Claims 7-13, and new Claims 14 and 15 depending therefrom all patentably distinguish over Miyagoshi and Tiernan, whether these references are considered alone or together in any proper combination.

² Tiernan, Col 14, lines 26-58.

Consequently, in light of the above discussion and in view of the present amendment, the application is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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